U.S. Army Research, Development and Engineering Command Supports FCS

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The future of land warfare depends on the Army's ability to incorporate science and technology (S&T) into the Future Force. The U.S. Army Research, Development and Engineering Command (RDECOM) was established to consolidate S&T efforts that accelerate the Future Combat Systems (FCS) transition. The RDECOM System-of-Systems Integration (SOSI) organization's mission is to provide superior technology opportunities by influencing the Army's research, development and engineering (RD&E) portfolio to ensure technology dominance of the Current and Future Joint land forces. To accomplish this mission, some key SOSI initiatives include technology integration and assessment, modeling and simulation (M&S) and experimentation.

An FCS Multifunctional Utility/Logistics and Equipment (MULE) Vehicle is put through its paces during a recent capabilities demonstration. (U.S. Army photo courtesy of Program Manager Unit of Action.)

Technology Integration and Assessment

RDECOM SOSI conducts technology integration and assessment by integrated product teams (IPTs). The IPTs consist of members from RDECOM headquarters and all RD&E centers, the Army Research Lab, national and international industry, academia and other government agencies. They provide strategic evaluations, develop technology road maps, recommend technologies to fill current and future operational capability gaps, identify risk, prevent undesired risk mitigation and promote cooperation and collaboration opportunities. IPTs do not manage or execute specific programs or allocate resources. This nonvested aspect of IPTs coupled with broad member participation enables them to provide unbiased and comprehensive technology assessments.

Figure 1 illustrates the horizontal integration function provided by the IPTs. At present, there are nine standing IPTs: countermine and counterimprovised explosive device, lethality, survivability, network, supportability, robotics, nanotechnology, biotechnology and power and energy. These IPTs focus on broad capabilities or technologies that support the Current and Future Forces. Additional IPTs are being considered, and all IPTs are periodically evaluated according to the Army's changing requirements.

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IPTs serve a wide variety of customers ranging from combatant commanders to program executive officers, program managers and U.S. Army Training and Doctrine Command (TRADOC) future analysts. They provide their assessments and recommendations to senior Army leadership to strategically guide and support Army S&T. IPTs evaluate proposed and existing RDECOM Army Technology Objectives (ATOs) on the ability to satisfy customer requirements. FCS is a primary customer and receives support from all RDECOM IPTs.

An example of IPT support to the FCS program is Active Protection Systems (APS) (see Figure 2). APS defeats incoming threat munitions before they reach their targets. The survivability IPT is currently working with the FCS program to jointly develop the

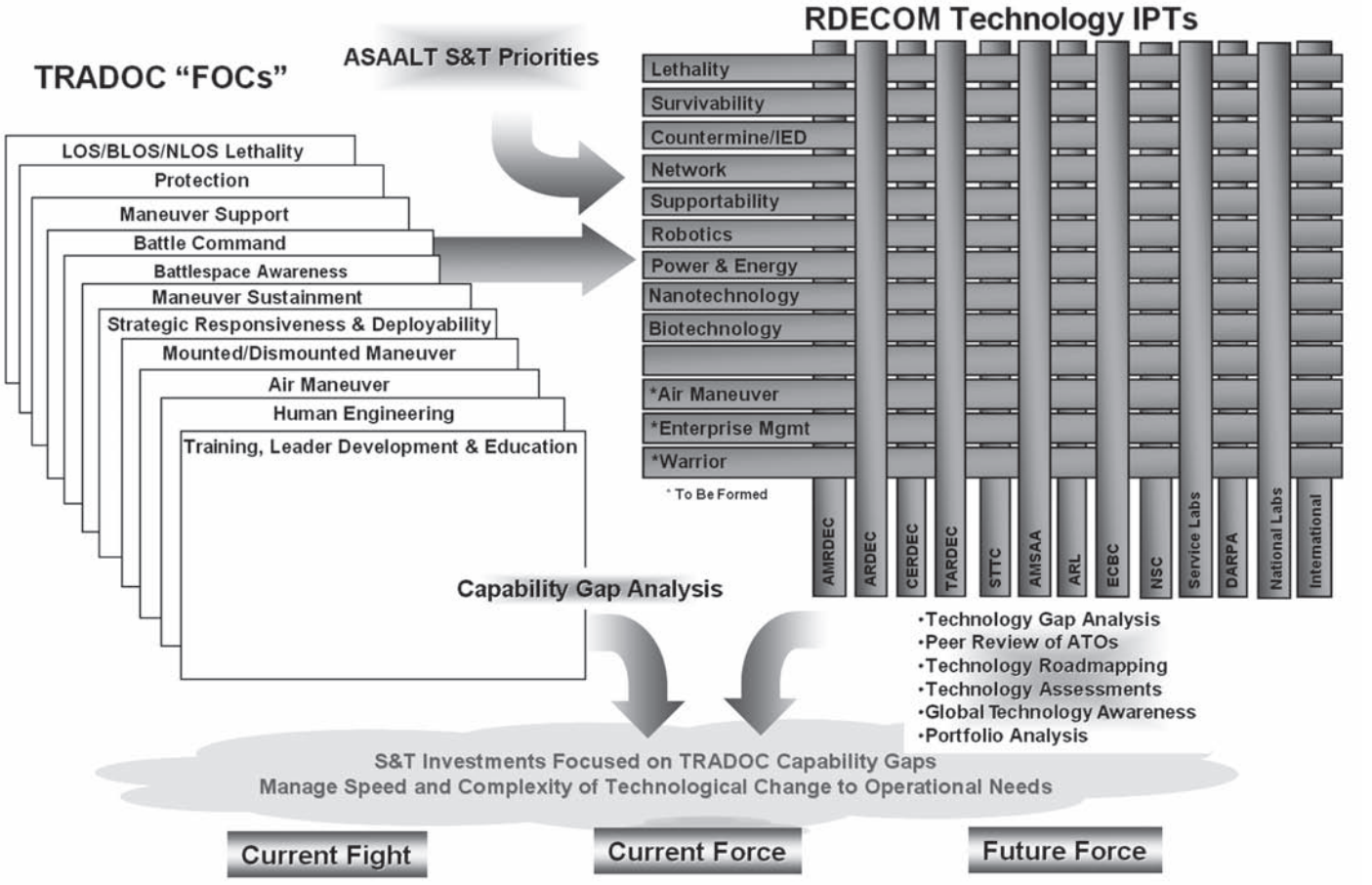

Figure 1. Horizontal Technology Integration

objective technical architecture and identify critical technologies for FCS' APS subsystems, and has contributed numerous technical experts to assist the FCS program conducting the trade-off studies and analysis necessary to determine the appropriate APS acquisition strategy for both Current and Future Forces.

The robotics IPT is investigating several broad initiatives critical to FCS, including perception, intelligent control architecture and human-machine interface. Further, robotics IPT members have provided expertise in developing the technical specifications and architecture of the FCS Autonomous Navigation System, Robotic Multifunctional Utility/Logistics and Equipment Vehicles and Armed Robotic Vehicles. They also provided technical evaluations of laser radar hardware and processing algorithms for obstacle detection, terrain classification and navigation and collision avoidance.

RDECOM not only supports FCS with technical performance evaluations but also provides early evaluation of affordability and producability via the Manufacturing Technology (ManTech) program. Examples of ManTech programs directly supporting FCS include manufacturing methods for Structural and Appliqué Armor, Dual Band Focal Plane Array and Advanced Gun Barrels. The ManTech program facilitates transition of newly developed technologies to production.

M&S

M&S is another critical element of support to the FCS program. FCS has complex SoS dependencies that require rigorous M&S. The RDECOM Modeling Architecture for Technology, Research and Experimentation (MATREX) ATO supports this effort. MATREX is a persistent, secure, distributed and reusable simulation environment where subsystem models can be integrated for analysis, evaluations and technology trade-offs. It assists in the analysis of force-on-force concepts for Unit of Employment (UE) in support of Brigade Combat Teams in a simulated environment for network-centric warfare and network battle command (see Figure 3). The MATREX ATO will provide enhanced capability to address such M&S issues as facilitating the integration of engineering-level models into the simulation environment, developing tools and interfaces to rapidly configure models and exposing interfaces in legacy simulation systems to interoperate in the MATREX environment.

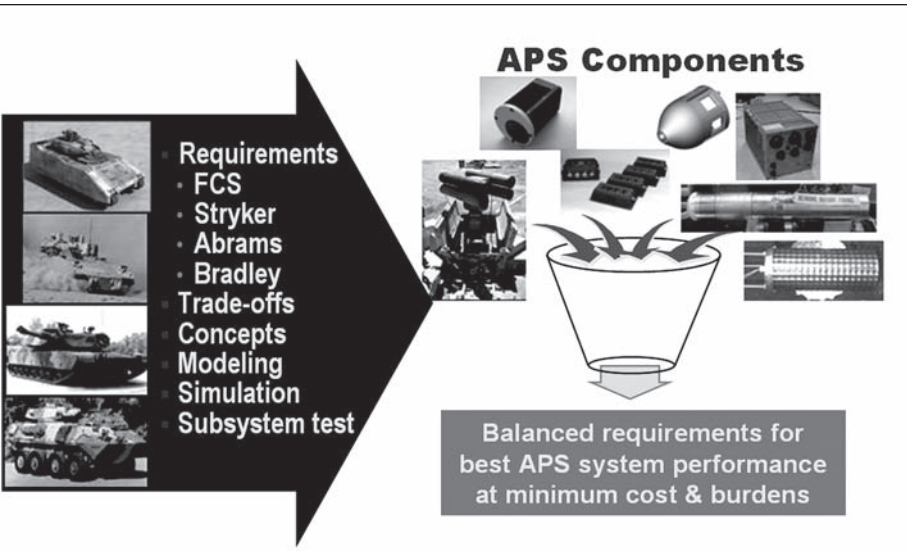

Figure 2. APS Technology for FCS

Various MATREX architecture and environment versions, including tools, have been delivered to the FCS Lead Systems Integrator (LSI) and are the foundation for the LSI's SOSI Laboratory Virtual Framework Version 1.0. Specific capabilities modeled are lethality and vulnerability, non-line-of-sight, vehicle dynamics and mobility, missile, human performance modeling, situational awareness and communications effects and visualization. MATREX was also delivered to TRADOC and the U.S. Army Test and Evaluation Command (ATEC), who both use it to support the FCS LSI. MATREX's final version will be multiresolution for enhanced

RDECOM's technical and professional staff stands ready to assist FCS program integrators with strategic and technical performance evaluations from their office at Fort Belvoir, VA.

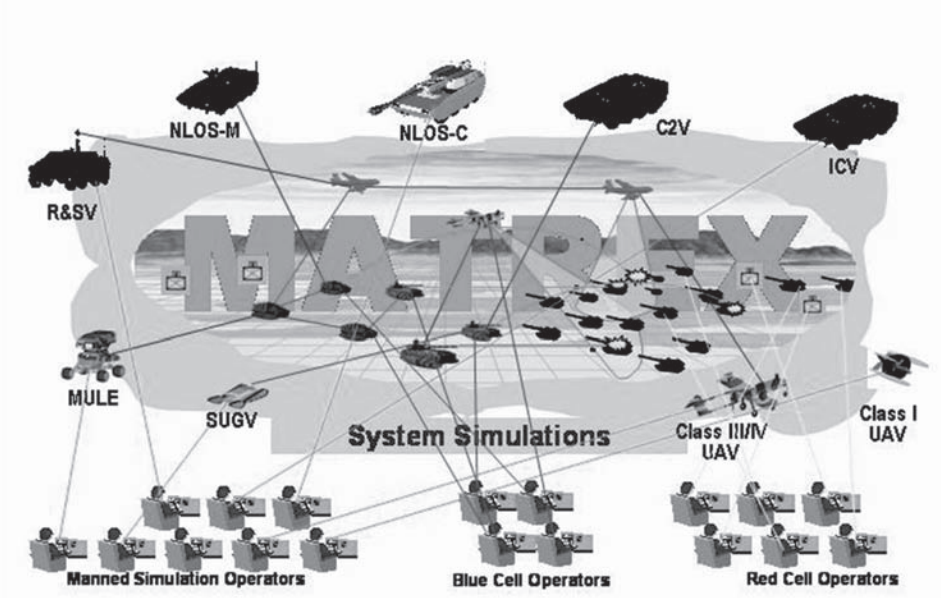

Figure 3. Modeling and Simulation

large-scale exercises and scalable in virtual and/or constructive modes from individual platform or Soldier level to the UE. It will also reduce the time and cost of developing and evaluating FCS concepts and products.

Experimentation

Experimentation is an important FCS program aspect. RDECOM is consolidating its experimentation activity information in coordination with TRADOC, ATEC, FCS and other relevant communities. RDECOM is working closely with TRADOC to provide an experimentation-planning annex to the yearly Army Concepts Development Experimentation Plan. This is expected to lead to an RDECOM Experimentation Campaign Plan intended to assist the cross-command and internal command experimentation coordination activities. The RDECOM Experimentation Campaign Plan will identify all FCS-related experimental activities within the command.

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APS technology will benefit all combat platforms as FCS components are spiraled into current weapon systems like this M-2 Bradley Fighting Vehicle from 1st Battalion, 15th Infantry Division, on patrol near Samarra, Iraq, May 29, 2005. (U.S. Air Force photo by SMSG Kim M. Allain.)

RDECOM has initiated an effort to consolidate enterprise management information in an automated S&T Enterprise Management (STEM) database. STEM includes all relevant ATO information. It tracks programs of specific interest to FCS and provides automated data management to measure progress, such as experimentation results and technology readiness level progression. FCS is developing several technology transition agreements (TTAs) with RDECOM that specify maturation requirements for transition. STEM will enable RDECOM management to comprehensively monitor multiple FCS TTAs.

RDECOM SOSI initiatives fully support FCS. RDECOM's SOSI organization's vision is to be the first-choice provider for driving and focusing Joint warfare technologies for the Future Force, and FCS is the primary Future Force enabler.

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